Unusual presentation of more common disease/injury

A case of recurrent spontaneous pneumothorax during pregnancy treated with video assisted thoracoscopic surgery

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Summary

Pneumothorax during pregnancy is uncommon. Recently ambulatory chest drainage has been advised to treat the pneumothorax and to cover the delivery period. This imposes restrictions on the mother with associated co-morbidity. The authors present a case of recurrent chest-tube resistant pneumothorax during pregnancy which had persisted for 4-weeks. To guide management of a patient referred in the third trimester of pregnancy the authors undertook a systematic review. This led to definitive video assisted thoracoscopic surgery (VATS) for bullectomy and pleurodesis which was successful without either peri-operative or peri-partum complications or recurrence of pneumothorax. Our review suggests that a VATS approach during pregnancy is both safe and effective.

BACKGROUND

The accelerated pattern of breathing, repeated Valsalva manoeuvres, intubation and positive pressure ventilation may increase the risk of further pneumothoraces in pregnancy.¹ Significant pneumothoraces leading to hypoxia could be poorly tolerated by both mother and foetus. The normally low PO₂ in foetal umbilical vein blood (typically 4.65 to 6.0 KPa) provides marginal reserves if maternal oxygenation falls.¹ Recently ambulatory chest drainage has been advised to treat pneumothorax during the delivery period. This imposes restrictions on the mother and has its own co-morbidity. To guide our management of a patient referred in the third trimester of pregnancy we undertook a systematic review. This led us to undertake definitive video assisted thoracoscopic surgery (VATS) for bullectomy and pleurodesis which was successful without either peri-operative or peri-partum complications or recurrence of pneumothorax. Our review suggested that a VATS approach during pregnancy was both safe and effective. VATS pneumothorax surgery was preferred to open thoracic surgery because although there is no published incidence of recurrence with either approach, VATS surgery is associated with reduced postoperative pain and shorter hospital stay. We recommend this approach to the treatment of pneumothorax in pregnancy.

CASE PRESENTATION

A 29-year-old woman at 26 weeks gestation (gravida 3, para 0) presented with an acute left sided pneumothorax. She had a 10 pack year smoking history and no other relevant medical history. This was aspirated, the lung re-expanded and she was discharged. She presented

a week later and was treated with a fine bore tunnelled intercostal drain. Four days after insertion, the intercostal drain was removed after lung re-inflation was confirmed. After a further 48 h observation she was discharged home.

Over the next 3 weeks she had three recurrences of her left sided pneumothorax, each of which was managed by intercostal drain insertion. During the fourth episode of pneumothorax as seen in the chest x-ray (figure 1), after

Figure 1 Chest X-ray showing the left pneumothorax on the fourth presentation. The red arrows show the collapsed lung edge (>50% collapse) within the left hemi-thorax.

Table 1 Case reports of spontaneous pneumothorax occurring during pregnancy.

Study	Maternal Age (years)	Gestation (weeks)	Underlying Lung Disease	Initial Management	Definitive Management	Obstetric Outcome
Farrell, 1983 ⁷	19	39	Bullae	Chest Drain	Postpartum Thoracotomy	Vaginal Delivery
Grass, 1957	31	15	Histoplasmosis	Observation	Resolution	Vaginal Delivery
Brantley, 1961	26	31	URTI	Chest Drain	Postpartum Thoracotomy	Forceps
Jonas, 1964	19	39	None	Chest Drain	Resolution	Vaginal Delivery
Vance, 1968	36	39	URTI	Chest Drain	Resolution	Forceps
Stewart, 1979	18	34	None	Chest Drain	Resolution	Vaginal Delivery
Dhalla and Teskey, 1985 ⁸	25	4	Bullae	Chest Drain	Antepartum Thoracotomy	Forceps
	26	8	None	Chest Drain	Antepartum Thoracotomy	Forceps
	28	14	Previous Pneumothorax	Observation	Antepartum Thoracotomy	Forceps
Atkinson, 1987 ⁹	29	2nd Tri	α 1-antitrypsin deficiency	Chest Drain	Resolution	Forceps
Temdrup <i>et al</i> , 1989 ¹⁰	25	12	None	Chest Drain	Resolution	Vaginal Delivery
Schwartz <i>et al</i> , 1994 ¹¹	26	10	Hyperemesis Gravidarum	Observation	Resolution	Vaginal Delivery
Levine and Collins, 1996 ⁵	26	32	Apical blebs	Chest Drain	Postpartum Thoracotomy	Vaginal Delivery
Van Winter <i>et al</i> , 1996 ¹²	26	23	Bullae	Chest Drain	Antepartum Thoracotomy	Vaginal Delivery
Bernasko <i>et al</i> , 1997 ¹³	30	15	Apical blebs + cocaine use	Chest Drain	Antepartum Thoracotomy	Vaginal Delivery
Chan <i>et al</i> , 1997 ⁶	27	27	Apical blebs + cocaine use	Chest Drain	Antepartum Thoracotomy	Vaginal Delivery
	39	31	Apical blebs + cocaine use	Chest Drain	Resolution	Induced SVD
	28	19	None	Chest Drain	Postpartum VATS	Caesarean Section
Reid and Burgin, 2000 ¹⁵	29	32	Lung Cysts	Chest Drain	Antepartum VATS	Vaginal Delivery
Cooley <i>et al</i> , 2002 ¹⁶	33	16	Bullae	Observation	Resolution	Vaginal Delivery
Gorospe <i>et al</i> , 2002 ¹⁷	27	38	None	Chest Drain	Resolution	Vaginal Delivery
Branton, 1972	26	31	URTI	Chest Drain	Postpartum Thoracotomy	Forceps
Freedman, 1982	29	10	Rheumatic Fever	Observation	Resolution	Vaginal Delivery
Karson, 1984	20	11	Hyperemesis Gravidarum	Observation	Resolution	Forceps
Guerin, 1988	27	37	Asthma	Chest Drain	Resolution	Caesarean Section
	31	36	None	Chest Drain	Resolution	Vaginal Delivery
	25	39	URTI	Chest Drain	Resolution	Vaginal Delivery
Chiner, 1990	27	8	None	Chest Drain	Resolution	Vaginal Delivery
Brodsky, 1993	28	12	Previous Pneumothorax	Chest Drain	Postpartum VATS	Vaginal Delivery
Giampaglia, 1994	23	32	None	Chest Drain	Postpartum Thoracotomy	Caesarean Section
Wright <i>et al</i> , 2002 ¹⁸	35	37	Trophoblastic tumour	Chest Drain	Postpartum VATS	Vaginal Delivery
China <i>et al</i> , 2005 ¹⁹	32	36	None	Aspiration	Resolution	Vaginal Delivery
Nishida <i>et al</i> , 2005 ²⁰	29	20	Apical blebs	Chest Drain	Antepartum VATS	Vaginal Delivery
Wong <i>et al</i> , 2006 ²¹	34	32	Apical blebs	Chest Drain	Postpartum Thoracotomy	Caesarean Section
Schoenfeld <i>et al</i> , 1986	27	24	Previous Pneumothorax	Not recorded	Postpartum Thoracotomy	Not recorded
Wennergren <i>et al</i> , 1990	23	30	None	Chest Drain	Postpartum Thoracotomy	Caesarean Section
Warren <i>et al</i> , 1993	32	12	Lymphangiomyomatosis	Chest Drain	Antepartum Thoracotomy	Vaginal Delivery
Sills <i>et al</i> , 2006 ²²	21	5	Previous Pneumothorax	Chest Drain	Antepartum VATS	Vaginal Delivery
Lal <i>et al</i> , 2007 ¹	26	1st Tri	None	Aspiration	Resolution	Caesarean Section
	22	11	None	Aspiration	Postpartum VATS	Caesarean Section
	27	15	None	Observation	Postpartum VATS	Caesarean Section
	19	11	None	Aspiration	Resolution	Ventouse
	22	11	Asthma	Chest Drain	Postpartum VATS	Fetal loss week 11
Tanase <i>et al</i> , 2007 ²³	25	34	None	Chest Drain	Resolution	Vaginal Delivery
Jain <i>et al</i> , 2009 ⁴	38	32	None	Chest Drain	Postpartum VATS	Vaginal Delivery

URTI, upper respiratory tract infections; VATS, video assisted thoracoscopic surgery;

chest drain insertion there was a continued air leak for 4 days. At this point, and after discussion between chest physicians and obstetricians, a high resolution CT (HR-CT) scan was performed. The HR-CT scan showed left apical bullae, the lung was not fully inflated with the intercostal drain in situ (figure 2). Serial foetal ultrasound scanning over this period found a viable breech presentation singleton foetus with parameters in keeping with gestational age. Liquor volume and foetal movements and heart rate variability were within normal limits. She was then referred for thoracic surgery management.

TREATMENT

The 2003 British Thoracic Society guidelines on the management of pneumothorax² did not include presentation

in pregnancy suggesting the rarity of the condition. The 2010 guidelines for the management of pneumothorax³ state that there is level C evidence that simple observation and aspiration are usually effective during pregnancy, with elective assisted delivery and regional anaesthesia at or near term. The guidelines also state level D evidence that a VATS procedure should be considered after birth.

After discussion between the patient, her family and all professionals it was decided to offer a surgical resolution to this recurrent problem to which she gave informed consent.

We chose to undertake VATS pneumothorax surgery because:

- It is our preferred technique for pneumothorax surgery as it has smaller incisions than open surgery

Figure 2 High Resolution CT scan showing bullae in the apex of the left lung.

Table 2 Characteristics of patients

Patient characteristics	
Age of patient at pneumothorax presentation	
Range	18–39 years
Mean	27 years
Trimester at pneumothorax presentation	n (%)
First	16 (36%)
Second	6 (14%)
Third	23 (50%)
Underlying lung disease	n (%)
None	17 (36%)
Bullae	4 (9%)
Apical blebs	6 (14%)
Lymphangiomyomatosis	1 (2%)
α 1-antitrypsin deficiency	1 (2%)
Upper respiratory tract infection	4 (9%)
Asthma	2 (5%)
Previous pneumothorax	4 (9%)
Hyperemesis gravidarum	2 (5%)
Rheumatic fever	1
Histoplasmosis	1
Placental site trophoblastic tumour	1
Lung cysts	1

- ▶ VATS surgery is associated with reduced postoperative pain and shorter hospital stay compared to thoracotomy
- ▶ There are no incidences of recurrence following VATS pneumothorax surgery in pregnancy
- ▶ She had a persistent airleak despite prolonged tube drainage which itself is associated with complications such as empyema and wound infection.

A dose of 12 mg intramuscular betamethasone was given to aid foetal lung maturity in the event of operative complications necessitating delivery. Foetal ultrasound examination was again normal.

At 34 weeks gestation the patient underwent a left sided VATS procedure. Three ports were used (2 × 1 cm and 1 × 1.5 cm). Peri-operative foetal cardiotocography remained normal. The surgical procedure took 15 min

Table 3 Summary of management of pneumothorax during pregnancy

Definitive management	No. (%)
Observation only	4 (9%)
Aspiration only	3 (7%)
Chest tube drainage	13 (29%)
Surgery	
VATS - Antepartum	3 (7%)
VATS - Postpartum	7 (14%)
Thoracotomy - Antepartum	7 (16%)
Thoracotomy - Postpartum	9 (18%)

Table 4 Obstetric outcomes

Obstetric outcome	No. (%)
Spontaneous vaginal delivery	26 (57%)
Forceps / Ventouse delivery	9 (20%)
Caesarean section	8 (18%)
Not reported	1 (2%)
Foetal loss	1 (2%)

(after induction of anaesthesia) and was uncomplicated. The left apical bulla was resected and a mechanical pleural abrasion was performed. Two 24 French intercostal chest drains were inserted and connected to 4kPa suction. Chest x-ray confirmed satisfactory placement of the chest tubes with full re-inflation of the lung. Suction to the chest drains was applied continuously for 48 h and the drains were removed at 72 h. A chest radiograph after drain removal showed full lung inflation and the patient was discharged the next day.

OUTCOME AND FOLLOW-UP

She had no further incidences of pneumothorax. At 36 weeks she went on to have a normal vaginal delivery to a healthy baby with no complications.

DISCUSSION

We identified 46 previously published cases of pneumothorax occurring during pregnancy (table 1). The patients involved had a mean age of 27 years; they had presented at various stages of pregnancy and 36% had no underlying lung disease (table 2). Patients were treated by surgery via thoracotomy (34%), VATS (21%) and by chest tube drainage (29%) (table 3). 57% of patients went on to have spontaneous vaginal deliveries, 20% had forceps assisted deliveries and 18% delivered by caesarean section (table 4). There are two reports of women delivering successfully with a chest tube in place then going on to have definitive pneumothorax surgery. One by VATS⁴ and the other via thoracotomy.⁵ There was one case of foetal loss which took place at 11 weeks gestation.¹ This was in a case of spontaneous pneumothorax managed by intercostal tube drainage initially with the chest drain remaining insitu during delivery of the deceased foetus. The mother went on to have VATS pneumothorax surgery subsequently. In a separate case, labour was induced at 34 weeks due to foetal distress⁶ and a healthy neonate was delivered. No woman suffered an acute recurrence of pneumothorax during labour or delivery after definitive surgical treatment via VATS or throacotomy.

Learning points

The literature review revealed the following options to manage this patient:

1. Pneumothorax surgery via thoracotomy
 - Advantages – no published recurrence of pneumothorax in pregnancy, thoracic surgeons familiar with this technique, established technique to reduce risk of further pneumothorax
 - Disadvantages – requires general anaesthetic, complications of thoracotomy.
2. Pneumothorax surgery via VATS
 - Advantages – no published recurrence of pneumothorax in pregnancy, advantages of VATS versus thoracotomy (less postoperative pain compared, reduced hospital stay compared to thoracotomy, cosmesis)
 - Disadvantages – Most but not all centres offer VATS surgery for pneumothorax, requires general anaesthesia, complications of surgery
3. Repeated chest tube drainage
 - Advantages – avoids general anaesthetic
 - Disadvantages – pain, not definitive treatment, risk of chest tube blockage, increased risk of further pneumothorax with respect to VATS or thoracotomy
4. Chest tube drainage to continue through pregnancy +/- pneumothorax surgery after delivery
 - Advantages – avoids general anaesthetic during pregnancy,
 - Disadvantages – prolonged period of ambulatory drainage with complications
5. Patient choice and informed consent
 - The patient was fully informed and involved in the decision making process which resulted in a good outcome.

Competing interests None.

Patient consent Obtained.

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